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INSTRUCTION MANUAL

MODEL 301

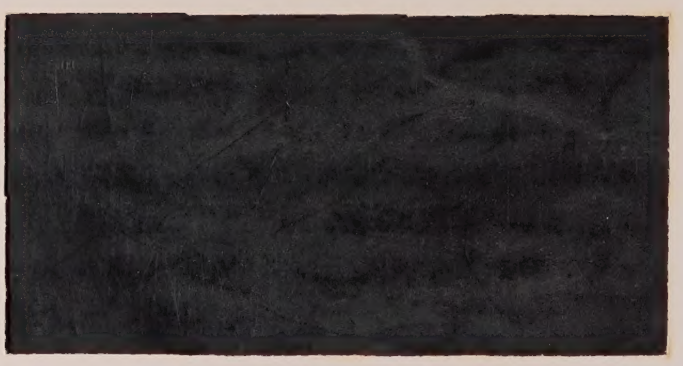
AC MICROAMMETER

FOR SERIAL # 134

QT

- REGULATED POWER SUPPLIES
- ELECTRONIC INSTRUMENTS

Quan-Tech
LABORATORIES INC.
BOONTON, N. J.



INSTRUCTION MANUAL

MODEL 301

AC MICROAMMETER

FOR SERIAL # 134

QUAN-TECH LABORATORIES

60 PARSIPPANY BLVD. BOONTON, NEW JERSEY

TELEPHONE DE 4-8500

MODEL 301 MICROAMMETER

GENERAL

The Quan-Tech Model 301 Microammeter is designed for Current measurement of transistor circuits, magnetic amplifiers, small servo systems, and other similar networks. Its low input impedance and extreme sensitivity make low level current measurement possible without affecting the circuit under test.

Two input probes are provided:

1. A clamp-on probe, which enables quick measurements to be made of currents within the range of 300 microamperes to 100 milliamperes without disconnecting leads in the circuit under test.

2. An insertion probe, which provides for greatest accuracy of measurement over wide current and frequency ranges and with greatest sensitivity (3 microampere full scale meter reading).

SPECIFICATIONS

Sensitivity
With insertion probe, 3 ua to 100 ma full scale.
With clamp-on probe, 300 ua to 100 ma full scale.

Accuracy
With insertion probe, $\pm$2% of full scale at 1 KC.
With clamp-on probe, $\pm$5% of full scale at 1 KC.

Frequency
With insertion probe, flat within $\pm$2%, 50 cycles to 100 KC, -3 db at 10 cycles and 1 MC.
With clamp-on probe, $\pm$5%, 100 cycles to 100 KC, -3 db at 50 cycles and 1 MC.

Input Impedance
2 ohms plus 8 uh, 60 mmf to ground on ranges 3 ua through 1 ma. Negligible impedance and capacitance on ranges 300 ua and 100 ma.

Oscilloscope Connection
0.1 volt into 10 K ohms.

CONTROLS AND INDICATORS The controls and indicators comprise:

1. A power input cord with integral plug which is permanently attached to the instrument at the back.

2. The power switch which is provided with a pilot indicator.

3. The meter range switch which is directly below the meter.

4. The connector for attaching either one of the two probes.

5. An output jack for the connection of oscilloscope or other external instrument.

OPERATION To use Quan-Tech Model 301 Microammeter, proceed as follows:

1. With power switch at OFF, plug power cord into 115-volt, 60-cycle supply.

2. Turn meter multiplier control to 1000.

3. Turn power switch to ON.

NOTE. Although this instrument is completely transistorized, a daily warm-up period of a few minutes is required. If the instrument has not been used for several days, the warm-up period should be extended to 15 minutes. This enables the electrlytic capacitors to reduce their noise by reforming.

4. Select one of the two probes and connect it to the front panel. As a guide for the selection and use of the probes see "Operational Notes" below.

5. Connect the probe to the circuit under test.

6. If meter indication is very small, turn meter multiplier switch to lower value until meter indication comes to mid-scale or above.

OPERATIONAL NOTES

For quickest and easiest measurements, within the range of 300 ua to 100 ma, use the clamp-on probe. This probe is carefully constructed of high permeable magnetic material and the mating surfaces are lapped to insure minimum leakage. This probe forms a transformer having a turns ratio of 1 to 100 when clamped around a wire.

> CAUTION. Although this probe is built as ruggedly as its nature permits, it should be handled with care to avoid damage to or distortion of the mating surfaces. A thin film of light lubricating oil should be applied to the lapped surface from time to time.

For greater sensitivity and accuracy, use the insertion probe. This probe is a current transformer enclosed in a mu metal shield to eliminate stray magnetic pick-up. It has two turn ratios; 1 to 1 and 1 to 100. The 1 to 1 ratio permits measurements down to 3 ua full scale with a noise level less than 0.1 ua.

Care should be taken to avoid excessive currents applied to the probes. When the instrument is adjusted in the range of 300 ua to 100 ma not more than 500 mà DC should be applied. With the insertion probe and in the 3 ua to 1 ma range the DC current should not exceed 10 ma. Larger currents will result in a decrease in the low frequency response and possible distortion. Extremely large currents may destroy the windings in the insertion probe.

Since there is some feed-thru capacity in the probe, it should be used on the low side of high impedance circuits at high frequencies.

Note that each probe is marked with a polarizing dot indicating the positive terminal to give a positive voltage at the output monitor.

This instrument is of the averaging type, calibrated in rms volts for pure sine wave. Allowances must be made for other waveforms.

It should be noted that there is no capacity coupling within this instrument. Consequently, if the input terminals are employed for anything other than the probes furnished with the instrument, DC should not be applied.

MAINTENANCE AND REPAIR

The instrument may be removed from the case by removing two screws on the side and four screws in the back panel. DO NOT REMOVE SCREWS FROM THE FRONT PANEL unless the instrument is out of its case and then only if it would facilitate repair.

The components in this instrument are standard commercial units. Replacement parts can be obtained from Quan-Tech Laboratories, but they also are probably available at your supplier.

In replacing components on the printed circuit board, the iron should be hot enough to make a good solder connection and applied for as short a period as possible. Pressure that might push the copper away from the board while hot should not be applied.

RECALIBRATION If recalibration is needed, proceed as follows:

1. Allow a warm-up period of at least 15 minutes so that the noise level is reduced to a minimum.

2. Using an oscillator tuned to 1 KC, apply 3 ua to the times 1 position of the insertion probe being careful to avoid pick up of stray fields due to large loops.

3. Adjust R7 to give -18 volts from the regulated supply.

4. Adjust R42 until meter reads 3ua on the 3 range.

5. Set current source to 10 ua and adjust R26 for full scale on the 10 range.

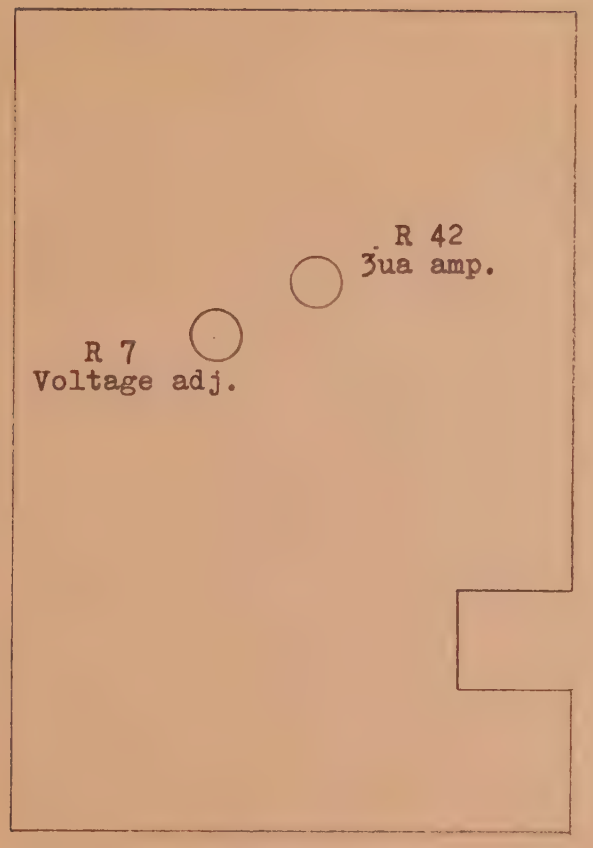
6. Set generator to 30 ua and adjust R29 for full scale on the 30 range.

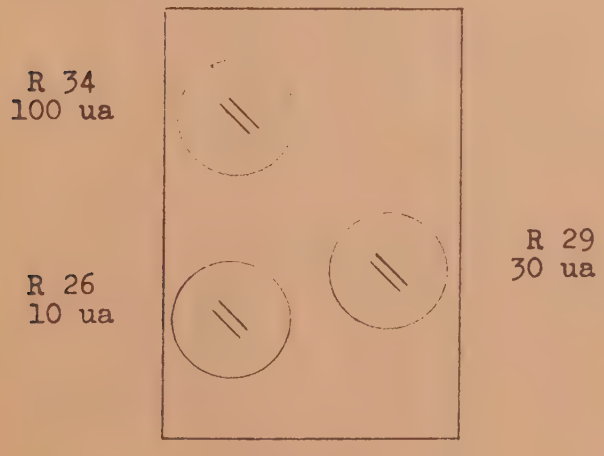
7. Set generator to 100 ua and adjust R34 for full scale on the 100 range.

8. Check ranges 300 and 1000 for alignment. If these positions show more than 1% error, connect an oscilloscope to the monitor output to detect possible stray pickup due to interference. Then repeat the above procedure.

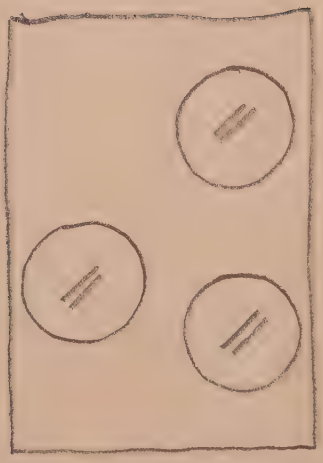
THEORY

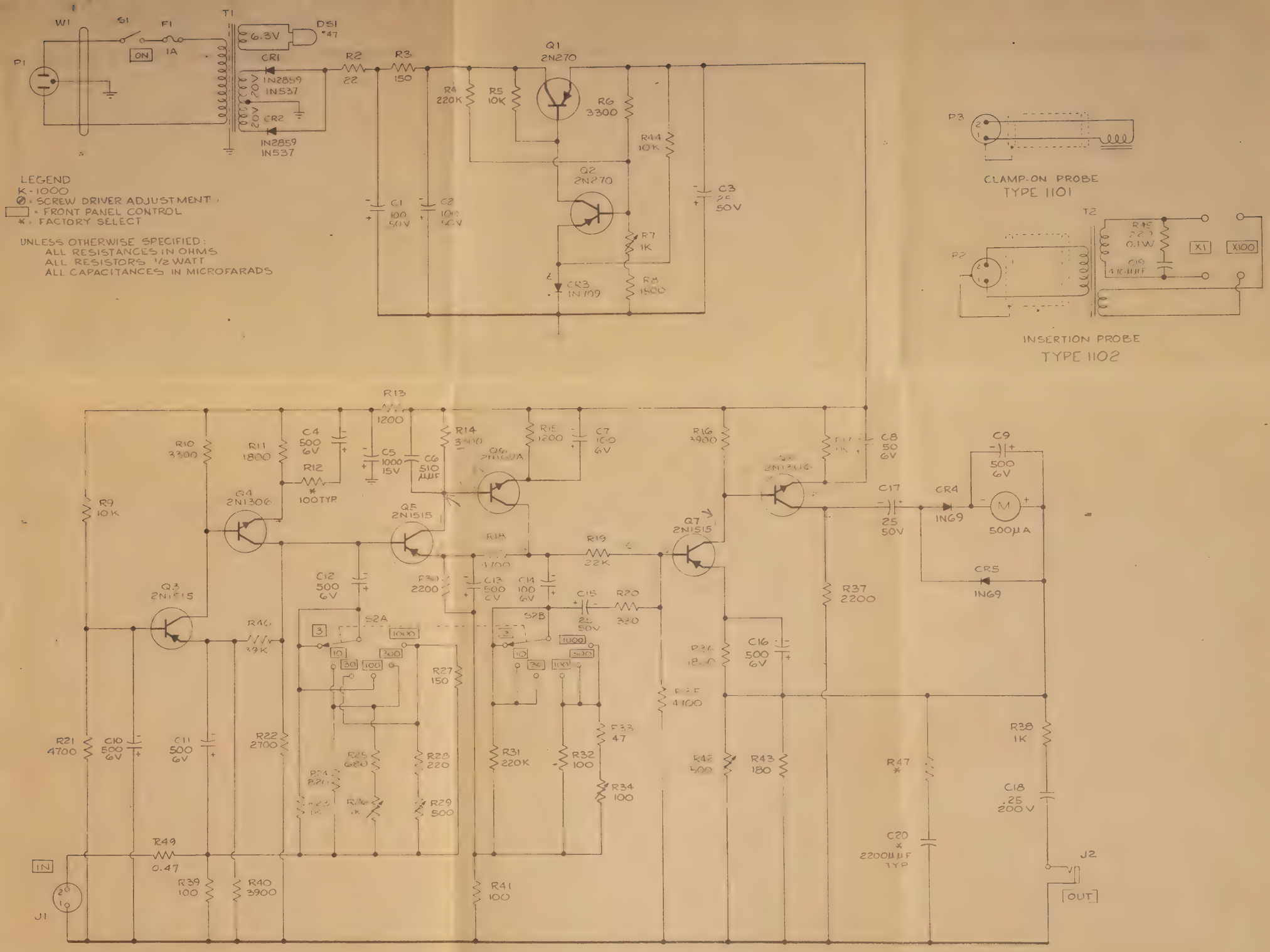
Quan-Tech Model 301 Microammeter consists of six transistor stages having a large amount of negative feedback around each amplifier pair. A grounded base input and a feedback factor of nearly unity from the second stage gives an input impedance of approximately 1 ohm and unity current gain. The amplifier pair comprising Q5 and Q6 is a gain stage. The final pair contains the metering circuit. Linearity is achieved by current feedback through the meter and diodes. An output monitor is provided from the feedback resistor in the final stage. A series resistance of 1K ohms and a blocking condenser protect the circuit from severe loading by the monitor. Additional stability and freedom from line transients is obtained from the regulated power supply.





Calibration adjustments

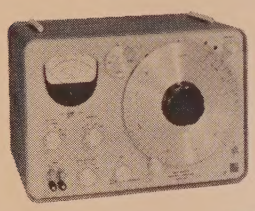




SCHEMATIC
A.C. MICROAMMETER
MODEL 301

C-1059- U

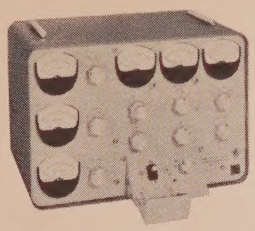
Quan-Tech INSTRUMENTS



MODEL 303
WAVE AND NOISE SPECTRUM ANALYZER

Fully transistorized spectrum analyzer covers frequency range from 30 cps to 100 kc. Front-panel selection of 4 constant bandwidths (10, 30, 100 & 1000 cps) the 100 & 1000 cps bandwidths are flat topped, simplifying noise computations, greatly improving accuracy, and simplifying tuning. Sensitivity: 100 μv to 300 v, full scale; down to 1· μv full scale with Model 203 Amplifier (see below). Additional features: ± 300 cps vernier; selection of long or short meter time constants; metering circuits compensated to minimize error from instantaneous noise pulses; overload protected meter; analog output for external monitoring.

PRICE: $1425



MODEL 310
TRANSISTOR NOISE ANALYZER

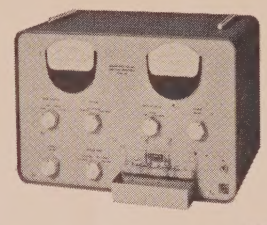
Measures noise at 100 cps, 1 kc and 10 kc simultaneously for 3-point spectrum analysis, allowing identification of 1/f-portion of transistor noise. Measures noise voltage over range from 0.01 to 3 μv/root cycle FS, and noise current from 1 to 300 pa/root cycle, FS. Collector current range, 0.05 to 30 ma; collector voltage range, 0.1 to 30 v. Measuring system automatically corrects for variations in transistor gain; measurement also provided of beta, I_{cbo} and I_{ebo}.

PRICE: $2075

MODEL 311 TRANSISTOR NOISE ANALYZER

Similar to above, except that collector current range extends from 5 to 1000 μamperes, for measurement of noise in low-collector-current devices. Beta measurement is not available in the Model 311.

PRICE: $2275



MODEL 315
RESISTOR NOISE TEST SET

Measures noise in resistors in conformance with specifications recommended by National Bureau of Standards and Method 308 of MIL STD 202 B. Tests resistors from 100 ohms to 22 megohms. Range of measurement: 0.6 μv in a decade to 1000 μv in a decade. Output of noise voltage for external monitoring; analog outputs of meter readings for data logging, etc. External cable included to permit locating test jig up to 10-feet from instrument.

PRICE: $1700

MODEL 2136

Same specifications as Model 315 except measures resistors down to 10 ohms.

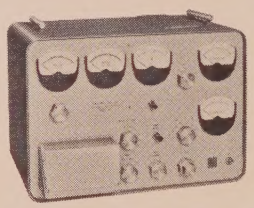
PRICE: $2300

MODEL 317
AMPLITUDE DISTRIBUTION ANALYZER

Establishes the amplitude-probability distribution of random signals to determine whether distribution is Gaussian, or to establish threshold requirements, false-alarm probabilities, etc. Amplifier response: 3db down at approx. 12 cps and 1 mc. Switching rate: 5 mc. Amplitude ranges: 100%, 10% and 1%, FS. "inverted" operation, indicating what percentage of time preset limit is not exceeded, also provided. Output to drive counter at front panel; voltage level may be swept from external source (such as oscilloscope sweep output) for automatic display.

PRICE: $395

MODEL 327
DIODE NOISE ANALYZER



Measures noise in back-biased semi-conductor diodes over range of 0.03 μv to 1 mv per cycle of bandwidth at 10 cps and 1 kc simultaneously. Diode test voltage adjustable up to 500 v; current, to 100 ma. Internally generated ramp sweeps test voltage and/or current automatically within maximum ratings. Sweep selectable in 3 speeds. A wide variety of signal and analog outputs for data logging, external monitoring, actuating external equipment, etc.

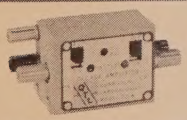
PRICE: $2450

MODEL 420 RANDOM NOISE GENERATOR

Provides stable "white" noise output that is gaussian in amplitude distribution from DC to 100 KC. Calibrated output is continuously variable from 0.01 to 1000 μv per root cycle. DC offset is less than 10 mv at max. output. Completely solid-state instrument measures 12" x 6" x 8".

PRICE: $525

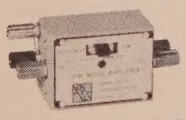
SOLID STATE AMPLIFIERS



MODEL 201-B
DC-COUPLED DECADE AMPLIFIER

Provides controlled gain of 10 from DC to 3 mc (3db). Completely self-contained; battery operated; built-in battery-condition indicator.

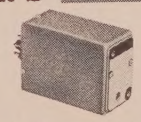
PRICE: $95



MODEL 203
LOW NOISE AC AMPLIFIER

Controlled gain of 100 from 30 cps to 100 kc (±0.5 db), down 3 db at 500 kc. Typical noise: 5 x 10^{-9}V and 3 x 10^{-12}A per root cycle at 1 kc. Two Mod. 203's may be plugged together in series for gain of 10,000. Battery operated; fully self-contained; built-in battery condition indicator.

PRICE: $125



MODEL 205
HIGH-STABILITY DC AMPLIFIER

Controlled gain of 10 from dc to 100 kc. Highly stable: typical shorted input drift less than 250 μv at room ambient. Octal basing for plug-in installation. External + and — 12 v. required.

PRICE: $105

All prices shown are F.O.B. Boonton, N. J. Prices and specifications subject to change without notice.

Quan-Tech LABORATORIES, INC.

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